



MAICH\_BioControl\_harmonia

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# 1. WHAT ABOUT INVASION OF INSECTS??

- *Harmonia axyridis*: an environmental risk assessment for Northwest Europe



- Ø In the past 100 years many exotic natural enemies have been imported, mass-reared and released as biological control agents for pest control
- Ø Although the majority of these releases have not resulted in unwanted side effects, some serious cases of non-target hazards by exotic biological control agents against insects and weeds have been recently reported



- Ø Due to the current popularity of biological control, new Invertebrate Biological Control Agents (IBCAs) will become available. To reduce the chance of releasing exotic natural enemies that might pose a risk for the environment, guidelines are being developed to assist in environmental risk assessment.
- Ø Various organizations have developed standards, including guidelines for the export, import, shipment, evaluation and release of biological control agents (e.g. EPPO 2002; IPPC 2005).



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- Ø Earlier, we collected, studied and summarized procedures to assess natural enemies currently used by about 25 countries and codes of conduct or guidelines produced by various organizations



- Ø Within an EU funded project an OECD working group and an IOBC Commission guidelines have been developed to harmonize information requirements for import and release of invertebrate biological control agents. Based on all this information, we designed a new comprehensive method. Subsequently, we also developed a quick scan to be used for natural enemies that are already in use.



- Ø In this way, we hope to provide biological control experts and risk assessors with the tools for a proper and uniform evaluation of the information provided in the application.
- Ø summarize the development of risk assessment procedures for natural enemies, we then describe a stepwise risk assessment procedure, and we will apply a quick scan and a comprehensive method to evaluate the environmental risks of *Harmonia axyridis* in Northwest Europe.



Risk assessment procedures for biological control agents are usually characterized by questions on four issues:

1. Characterization and identification of biological control agent
2. Health risks
3. Environmental risks
4. Efficacy



- Assessment of risks related to releases of natural enemies demands integration of many aspects of their biology, as well as information on ecological interactions.
- A comprehensive risk assessment comprises the following steps:



1. Identification and evaluation of potential risk of releasing a natural enemy,
2. A plan to minimize risk and mitigate unwanted effects of biological control agents
3. A risk/benefit analysis of the proposed release of the natural enemy, together with risk/benefit analyses of current and alternative pest management methods



- The last step is essential, because the risk/benefit posed by the release of an exotic natural enemy might particularly be considered acceptable in comparison with the risks posed by other control methods.



## Risk identification and calculation of risk index

- Normally, for a risk assessment, one will identify and evaluate the potential negative effects, and determine the probabilities that these will materialize
- The negative impacts of a biological control agent can be defined as any negative effect, which can be named and measured, such as direct and indirect negative effects on non-target organisms and negative effects on the environment.



- The risk of negative effects of the release a biological control agent is the product of the likelihood (L) of impact and the magnitude (M) of impact.
- The likelihood and magnitude of five groups (ecological determinants) of risks are usually considered: establishment, dispersal, host range, direct effects, and indirect non-target effects.
- Next, qualitative scales for likelihood and magnitude need to be described (Table 1), after which one may quantify the scales for likelihood and magnitude



Based on an evaluation of 31 cases of natural enemy introductions into Europe, the following risk categories were proposed

1. **Low risk category:** for organisms falling in this category, a proposal of no objection against release of the agent can usually be issued;
2. **Intermediate risk category:** for organisms falling in this category, the advise will be issued to come up with specific additional information before a conclusion concerning release can be drawn;
3. **High risk category:** for organisms falling in this category, generally a proposal to not to release the agent will be issued.



1. Low risk indices were found for many parasitoids, several predatory mites, and one predatory insect.
  2. Intermediate risk indices were found for all guilds of natural enemies: parasitoids, predatory insects, predatory mites, parasitic nematodes and entomopathogenic fungi.
- Entomopathogens (*Beauveria*, *Metarhizium* and *Steinernema*) all score intermediate because of their broad host range, but their very limited dispersal capacities strongly reduce risk.



The highest risk indices were found for  
predatory insects

1. *Harmonia axyridis*
2. *Hippodamia convergens*
3. *Podisus maculiventris*
4. *Orius insidiosus*

and parasitoids

1. *Encarsia pergandiella*
2. *Trichogramma brassicae*
3. *Cales noacki*



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Pupa (left) and adult (right)



Larva



Adult color forms



